

## AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE in charge]

By EARL C. THOM

The weather during May was warmer than normal over the western half of the United States and also over the extreme northeastern section. The largest departures from normal, about  $8^{\circ}$  F., occurred in the area of northwestern Utah, extreme southern Idaho and northeastern Nevada. Cooler weather than usual for the month was experienced over the remainder of the country, with the temperature in Indiana and extreme eastern Illinois  $4^{\circ}$  below normal.

The direction of the resultant winds during May was considerably north of normal (clockwise turning) over the eastern half of the country, and south of normal over the western section at the 1,500-meter level. At the 3,000-meter level the tendency for resultant winds to be more northerly than normal extended over all of the country except along the north Pacific coast and in the extreme south Florida area. At the 5,000-meter level the direction of the resultant wind was north of the 5 a. m. normal over the central part of the United States and was south of this normal in the western part of the United States and along the Atlantic coast. At the 1,500- and 3,000-meter levels the resultant velocities were somewhat above normal in the extreme northwestern and in the southeastern parts of the country. At the 5,000-meter level, higher than normal resultant velocities prevailed generally, especially over the central portion of the country where plus departures of between 5.5 and 6.1 meters per second obtained.

Winds at lower levels were in general more northerly than normal in the areas having below normal temperatures. This tendency has continued since the beginning of last winter.

The change in resultant wind direction from 5 a. m. to 5 p. m. during May at the 1,500-meter level was counterclockwise over a considerable portion of the United States. The opposite shift was, however, shown at this level over the plateau eastward from Medford, over the West Central and North Central States, along the eastern coast of the Gulf of Mexico, and at New York. At the 3,000-meter level, less of the area showed the counterclockwise shift of resultant winds between 5 a. m. and 5 p. m. At this level the shift to the northward occurred in the extreme southwest, in Colorado, in most of the extreme southeast and at Sault Ste. Marie. No well-defined tendency was shown in the change in resultant velocity between 5 a. m. and 5 p. m. at the 1,500-meter level in May. At the 3,000-meter level the 5 p. m. resultant velocity was somewhat higher than the corresponding 5 a. m. velocity over the eastern part of the United States and over the Pacific coast region, and somewhat lower over the plateau and portions of the Plains States.

Mean barometric pressure at the 5,000-foot level (chart VIII) was lowest over Sault Ste. Marie (840.6 mb.) during the month of May and was highest over Pensacola, Fla., (851.6 mb.). The mean pressure gradient at this level over the plains and mountains of the west was small, there being but slightly over 2 mb. difference between any two points in the area west of  $100^{\circ}$  west longitude. At somewhat higher levels (table 1) the highest pressure occurred over Miami and the lowest over the eastern Great Lakes. At the 1,500-meter level and higher, the mean pressures were higher during May over all parts of the United States than during April. The greatest increase in mean pressure from April to May was over the northern half of the United States, there being an average increase

of 8 millibars at the 10,000-meter level, with the largest single increase of 11 millibars occurring over Sault Ste. Marie, at that level. The smallest increase in pressure at upper levels occurred over the extreme southeastern part of the country.

The steepest mean pressure gradient over the United States in May occurred at the 7,000-meter level. At this level the pressure over Miami was 430 mb., and over Sault Ste. Marie was 410 mb.

May was warmer than April at all levels below 12,000 meters, except slightly colder at the 11,000-meter level at Pensacola and at Buffalo. It was colder in May than in April at the 12,000- and 13,000-meter levels over most of the country, the warmer than April tendency still holding over considerable of the southwest and the extreme west central regions and over an area in the east and north central part of the country. At 14,000 meters the temperatures in May were lower than in April except over the western Great Lake region and over southern Florida. At the 15,000-, 16,000- and 17,000-meter levels the May temperatures became successively higher than in April except in the Northwestern and West Central States and over the New England area, while at 18,000 meters the same or higher temperatures were everywhere noted except at El Paso and over New England.

At levels below 10,000-meters the temperatures in May were lower than during May of the previous year except in the Northwest and along the Pacific coast. At the 10,000- and 11,000-meter levels the temperatures were colder than in May 1939 over the entire country. At the next five higher levels the eastern half of the country shows an increase in temperature over the previous May. At Atlanta, Ga., for example, the change was  $-0.8^{\circ}$ ,  $-0.4^{\circ}$ ,  $+1.0^{\circ}$ ,  $+2.9^{\circ}$ , and  $+4.0^{\circ}$  for these five levels, respectively.

The altitude of the surface of mean freezing temperature for the month increased to the southward across the eastern part of the United States, the altitude of this surface was 2,200 meters at Sault Ste. Marie, 2,700 meters at Chicago, 3,400 meters at Nashville, 4,000 meters at Pensacola, and 4,400 meters at Miami. There was also an upward slope of this surface to the southwestward, the altitude being 2,600 meters at Minneapolis, 3,800 meters at Denver and 4,300 meters at Phoenix. The altitude of the mean freezing surface is much higher over the Plateau, Rocky Mountains, and west coast than it is at corresponding latitudes over the eastern half of the country. The elevation of this surface was 2,900 meters at Spokane, 3,600 meters at Boise, 4,000 meters at Ely, and 4,300 meters at Phoenix. The altitude of the mean freezing temperature at Ely was 4,000 meters, while at Lakehurst at about the same degree of latitude the altitude was 3,000 meters.

The minimum temperatures for the United States (table 1) were observed at the 12,000-meter level over Bismarck, N. Dak., Minneapolis, Minn., and Sault Ste. Marie, Mich. The minimum temperature occurred at the 13,000-meter level over the Northwestern States, over the west central area extending as far southward as Oklahoma City, over the southern Great Lake region, and over the New England States. The minimum occurred at 17,000 meters over the Southeastern States and along the southern border except at San Diego, where the level of minimum temperature was at 14,000 meters. The

lowest minimum temperature recorded over the United States in May was  $-68.6^{\circ}$  at the 17,000-meter level over Miami, while the highest minimum was  $-55.4^{\circ}$  over Minneapolis at the 12,000-meter level. Two Alaska stations, Fairbanks and Juneau, are also included in table 1. At these stations the minimum temperature occurred at the 10,000-meter level, with the higher minimum,  $-52.2^{\circ}$ , recorded at Fairbanks.

Tropopause data for May showing the mean altitudes and temperatures of the tropopause at various stations are shown in table 4 and on chart XIII.

Table 3 shows the maximum free-air wind velocities and their direction for various sections of the United States during May, as determined by pilot balloon observations. The extreme maximum for the month was 62 meters per second (149 miles per hour) reported on May 3 from the WSW, over Winnemucca at a height of 8,620 meters (nearly 5½ miles) above sea level.

TABLE 1.—Mean free-air barometric pressure ( $P$ ) in millibars, temperature ( $T$ ) in degrees Centigrade, and relative humidities ( $R. H.$ ) in percent, obtained by airplanes and radiosondes during May 1940

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																														
	Albuquerque, N. Mex. (1,620 m.)				Atlanta, Ga. (300 m.)				Billings, Mont. (1,089 m.)				Bismarck, N. Dak. (505 m.)				Boise, Idaho (864 m.)				Buffalo, N. Y. (220 m.)										
	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.							
Surface	31	838	16.9	39	31	980	16.5	68	30	892	13.4	54	31	956	9.6	73	31	915	13.9	55	28	987	9.4	86	31	1,013	16.4	86			
500					31	957	12.7	61					31	901	11.9	58	31	900	17.0	47	28	955	10.9	73	31	958	18.1	67			
1,000					31	903	15.3	56					31	849	9.1	56	31	849	16.0	38	28	846	6.0	69	31	903	15.4	61			
1,500					31	851	12.4	57	30	849	13.0	49	31	798	5.8	58	31	800	12.3	38	28	796	3.1	71	31	801	9.8	59			
2,000	31	801	16.6	36	31	801	9.3	69	30	800	10.0	48	31	751	2.7	57	31	753	8.4	39	27	748	0.2	70	31	754	6.9	57			
2,500	31	755	13.5	36	31	754	6.3	60	30	752	6.5	50	31	706	0.0	52	31	709	4.7	39	27	702	-2.4	69	31	709	4.2	55			
3,000	31	711	9.9	38	31	709	3.5	55	30	708	2.6	53	31	626	-6.2	48	31	626	-2.9	42	26	618	-7.9	63	31	627	-1.7	53			
4,000	30	629	2.0	43	31	626	-2.3	48	29	625	-6.5	48	31	547	-12.1	44	31	551	-10.2	43	26	544	-13.7	56	31	552	-5.7	47			
5,000	30	555	-5.9	48	31	551	-8.3	44	29	550	-11.6	57	31	482	-18.1	54	31	479	-19.1	40	26	476	-20.3	52	30	485	-13.9	43			
6,000	30	488	-12.9	48	31	484	-14.8	40	28	482	-25.2	52	31	418	-26.8	39	31	422	-23.9	43	26	415	-27.8	50	30	424	-21.0	40			
7,000	30	427	-19.6	45	30	423	-22.0	37	28	420	-25.2	52	31	362	-32.8	51	31	368	-31.7	43	26	360	-35.4	49	29	370	-28.8	38			
8,000	29	373	-27.3	42	30	369	-29.8	36	28	365	-32.8	51	31	314	-39.6	43	26	311	-42.8	42	29	320	-36.8	36	29	320	-36.8	36			
9,000	29	323	-35.5	41	30	320	-37.3	36	27	316	-40.8	42	27	270	-44.9	49	31	274	-47.5	51	26	268	-50.0	50	29	277	-44.4	44			
10,000	29	280	-43.8	40	30	276	-44.9	47	27	272	-48.8	47	27	231	-55.7	57	31	235	-54.9	59	26	230	-55.7	57	29	238	-51.4	54			
11,000	28	241	-51.6	40	29	237	-51.9	57	27	233	-55.7	57	27	197	-58.7	57	31	201	-59.9	59	26	196	-59.1	51	29	204	-57.5	51			
12,000	28	205	-58.6	40	29	203	-57.5	57	27	199	-60.5	57	27	168	-57.9	57	30	171	-61.5	55	25	167	-59.5	59	29	174	-61.4	54			
13,000	28	175	-62.7	40	28	173	-61.2	57	27	170	-61.2	57	27	144	-59.1	57	29	146	-60.3	57	22	142	-57.7	57	28	148	-61.7	57			
14,000	27	149	-63.0	40	28	147	-61.7	57	26	144	-59.1	57	26	128	-58.7	57	28	124	-58.8	57	22	121	-57.3	57	28	126	-61.8	57			
15,000	27	127	-62.3	40	27	125	-60.8	58	25	128	-58.7	57	25	105	-58.5	57	27	106	-58.4	57	21	104	-57.6	57	27	107	-62.3	57			
16,000	27	108	-62.9	40	25	107	-62.1	57	25	105	-58.5	57	25	84	-58.4	57	27	80	-57.6	57	20	78	-58.1	57	24	91	-62.9	57			
17,000	27	92	-63.1	40	24	91	-62.6	57	25	89	-58.0	57	25	69	-57.6	57	26	68	-57.6	57	20	68	-58.1	57	24	77	-62.0	57			
18,000	27	78	-62.8	40	23	77	-61.8	57	19	76	-57.1	57	22	77	-57.0	57	12	75	-57.9	57	12	72	-57.9	57	22	77	-62.0	57			
19,000	22	66	-60.9	40	14	66	-59.4	57	14	65	-56.5	57	5	65	-55.6	57	11	66	-56.3	57	8	64	-57.1	57	12	65	-60.0	57			
20,000	14	56	-59.0	40					9	55	-55.7	57								5	55	-56.7	57								
21,000	5	48	-58.3	40																											

Altitude (meters) M. S. L.	Stations and elevations in meters above sea level																				Lakehurst, N. J. (39 m.)							
	Denver, Colo. (1616 m.)				El Paso, Texas (1193 m.)				Ely, Nevada (1908 m.)				Fairbanks, Alaska (153 m.)				Joliet, Ill. (178 m.)				Juneau, Alaska (49 m.)							
	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.				
Surface	31	840	11.2	70	31	881	21.0	32	31	809	10.0	45	31	991	12.8	44	29	991	9.6	84	31	1,010	9.2	73	31	1008	11.6	83
500													31	951	10.5	45	29	954	11.1	72	31	956	6.6	75	31	954	12.6	64
1,000													31	895	6.6	47	29	898	8.9	70	30	899	3.0	78	31	899	11.3	59
1,500					31	850	21.5	31					31	842	2.4	60	29	845	6.4	71	30	845	-0.5	79	31	846	8.0	61
2,000	31	802	12.2	61	31	802	18.1	31	31	800	12.2	42	31	791	-1.8	55	29	795	3.7	71	29	793	-3.9	60	31	796	5.7	63
2,500	31	755	9.1	59	31	756	14.3	32	31	754	11.6	37	31	742	-5.6	60	28	747	1.0	72	27	744	-7.0	78	31	748	2.8	62
3,000	31	710	5.7	60	31	712	10.1	33	31	710	7.9	37	31	696	-9.1	61	28	702	-1.6	69	27	697	-10.0	76	31	703	0.3	58
4,000	31	628	-1.0	61	29	630	1.8	38	31	628	-0.1	40	31	610	-16.0	58	28	618	-6.6	62	27	612	-16.2	70	31	620	-5.4	54
5,000	31	553	-7.9	59	29	556	-6.0	43	30	553	-7.8	44	31	534	-23.0	55	28	544	-12.9	57	26	535	-22.9	66	30	545	-11.6	53
6,000	30	485	-14.4	54	29	483	-13.0	44	30	486	-14.4	41	31	465	-30.1	55	28	476	-19.7	53	26	466	-29.9	63	30	477	-18.0	51
7,000	30	425	-21.3	51	28	428	-19.9	40	29	425	-21.9	40	29	403	-37.8	53	28	415	-27.5	52	25	403	-37.5	63	30	417	-25.7	54
8,000	30	370	-28.7	48	28	374	-27.7	38	28	370	-29.8	39	28	348	-44.6	66	28	360	-35.2	51	25	348	-44.3	66</td				

TABLE 1.—Mean free-air barometric pressure (*P.*) in millibars, temperature (*T.*) in degrees Centigrade, and relative humidities (*R. H.*) in percent, obtained by airplanes and radiosondes during May 1940—Continued

Altitude (meters) M. S. L.	Stations and elevations in meters above sea level																											
	Medford, Oreg. (401 m.)				Miami, Fla. (4 m.)				Minneapolis, Minn. (263 m.)				Nashville, Tenn. (180 m.)				Norfolk, Va. <sup>1</sup> (10 m.)				Oakland, Calif. (2 m.)				Oklahoma City, Okla. (391 m.)			
	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.
Surface	31	968	15.3	59	31	1,015	20.1	84	31	981	11.2	70	30	993	14.7	77	24	1,016	16.1	75	31	1,015	13.5	81	31	969	17.5	71
500	31	956	15.7	56	31	959	20.1	75	31	984	10.8	67	30	956	16.3	66	24	959	17.0	56	31	957	12.2	81	31	956	18.0	64
1,000	31	902	13.6	54	31	905	17.2	73	31	899	8.8	66	30	901	13.5	62	24	904	14.0	50	31	902	14.7	54	31	902	17.0	55
1,500	31	850	10.5	59	31	853	14.3	71	31	846	6.3	65	30	849	10.1	63	24	852	10.4	49	31	850	13.5	45	31	851	14.0	58
2,000	31	799	7.7	61	31	804	12.6	61	31	796	3.6	67	30	800	7.3	63	24	802	6.8	49	31	801	10.8	40	31	801	11.4	58
2,500	31	752	5.2	55	31	757	10.6	55	30	748	9	67	30	752	4.7	61	24	754	3.8	48	31	754	7.7	36	31	754	8.6	55
3,000	31	707	2.1	53	31	713	8.2	44	30	703	-1.9	65	30	707	2.1	58	24	709	7	44	31	709	4.5	34	31	710	5.5	54
4,000	31	624	-3.4	44	30	631	2.6	37	30	619	-6.9	57	30	624	-3.3	50	24	626	-5.7	40	31	626	-1.4	30	31	627	-7.8	48
5,000	31	549	-10.4	37	30	557	-3.3	34	30	544	-12.8	51	30	549	-9.7	47	17	550	-11.9	31	31	552	-7.8	30	31	553	-7.6	42
6,000	31	481	-17.1	34	30	490	-9.7	30	30	477	-19.4	48	30	482	-16.3	45	—	—	—	31	484	-15.0	29	31	485	-14.2	40	
7,000	31	420	-24.3	36	30	430	16.9	28	30	416	-26.9	44	30	421	-23.6	43	—	—	—	31	423	-22.6	29	30	425	-21.0	40	
8,000	30	366	-32.0	36	29	375	-24.1	27	28	361	-34.7	43	30	367	-31.1	43	—	—	—	31	369	-30.4	29	29	370	-28.5	39	
9,000	30	316	-39.8	36	29	326	-31.8	26	25	312	-42.2	—	30	318	-38.7	43	—	—	—	31	320	-38.4	28	28	321	-36.7	39	
10,000	30	273	-47.2	29	29	283	-39.6	—	23	269	-48.8	—	30	274	-45.9	—	—	—	31	276	-46.4	—	28	277	-44.8	—		
11,000	30	234	-54.2	29	29	244	-47.0	—	22	231	-53.4	—	30	236	-52.3	—	—	—	31	237	-53.9	—	28	238	-52.8	—		
12,000	30	200	-59.4	29	29	209	-54.3	—	20	197	-55.4	—	30	201	-57.1	—	—	—	31	202	-60.3	—	27	204	-60.2	—		
13,000	29	170	-61.8	29	29	178	-59.9	—	20	169	-54.4	—	30	172	-59.9	—	—	—	31	172	-63.7	—	27	173	-64.4	—		
14,000	27	145	-60.4	29	29	152	-62.5	—	18	145	-54.1	—	30	146	-59.9	—	—	—	30	146	-62.9	—	24	147	-64.2	—		
15,000	27	123	-58.7	29	29	129	-64.7	—	16	124	-53.5	—	29	125	-59.4	—	—	—	29	124	-61.6	—	24	125	-63.6	—		
16,000	26	105	-58.0	28	28	109	-66.7	—	15	106	-54.3	—	28	106	-59.6	—	—	—	28	106	-61.5	—	20	106	-63.9	—		
17,000	25	90	-57.6	26	26	92	-68.6	—	13	91	-54.6	—	27	90	-60.1	—	—	—	28	90	-60.6	—	16	90	-63.7	—		
18,000	21	76	-56.8	22	22	78	-68.4	—	10	78	-54.7	—	22	77	-59.7	—	—	—	23	77	-59.5	—	13	76	-63.1	—		
19,000	13	65	-55.6	17	17	66	-65.9	—	5	66	-53.9	—	14	66	-58.5	—	—	—	13	68	-58.4	—	8	65	-61.9	—		
20,000	7	56	-54.4	6	6	56	-62.2	—	—	—	—	—	5	56	-56.3	—	—	—	9	57	-62.1	—	8	56	-59.8	—		

Altitude (meters) M. S. L.	Stations and elevations in meters above sea level																											
	Omaha, Nebr. (301 m.)				Pearl Harbor, T. H. <sup>1</sup> (6 m.)				Pensacola, Fla. <sup>1</sup> (24 m.)				Phoenix, Ariz. (339 m.)				St. Louis, Mo. (171 m.)				San Antonio, Tex. (174 m.)				San Diego, Calif. <sup>1</sup> (19 m.)			
	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.
Surface	31	979	14.3	63	31	1,015	22.2	84	31	1,014	21.1	73	31	970	24.3	29	31	993	14.6	73	31	994	20.7	76	31	1,011	16.6	84
500	31	956	14.6	58	31	960	20.7	80	31	960	19.5	61	31	952	27.3	24	31	955	15.0	64	31	957	20.7	71	31	955	14.8	79
1,000	31	901	12.5	56	31	906	17.6	81	31	905	17.0	52	31	900	26.4	19	31	900	12.3	64	31	904	19.4	65	31	901	16.0	53
1,500	31	849	9.7	57	31	854	15.1	73	31	854	14.0	49	31	850	22.8	19	31	847	9.0	66	31	852	16.9	62	31	850	16.1	35
2,000	31	799	6.7	58	31	804	12.5	71	31	804	11.0	47	31	802	18.8	20	31	798	6.1	68	31	803	14.2	58	30	801	14.2	31
2,500	31	751	3.8	58	31	758	10.9	55	31	757	8.3	41	31	756	14.7	21	31	750	3.4	66	31	757	11.8	53	30	754	11.3	32
3,000	31	706	0.9	57	31	714	8.9	42	31	712	5.7	39	31	712	10.7	23	31	705	1.2	61	31	713	8.8	51	29	710	8.2	32
4,000	31	623	-4.9	51	30	632	4.1	28	31	630	-0.3	38	30	557	-4.3	31	30	547	-11.0	53	31	557	-4.7	49	29	554	-5.3	33
5,000	31	548	-11.0	45	—	—	—	—	30	555	-6.2	33	30	557	-4.3	31	30	547	-11.0	53	31	549	-10.8	46	29	547	-12.2	36
6,000	31	480	-17.3	42	—	—	—	—	27	488	-12.4	27	30	489	-11.2	31	30	480	-17.4	51	31	490	-17.8	44	28	487	-19.8	46
7,000	31	420	-24.3	40	—	—	—	—	26	427	-19.7	27	30	429	-18.2	30	30	419	-24.7	50	30	420	-17.8	44	28	427	-19.8	46
8,000	31	365	-32.2	39	—	—	—	—	24	372	-27.6	24	30	375	-26.3	29	30	364	-32.1	48	29	375	-25.3	43	28	372	-27.9	46
9,000	31	316	-40.0	0	—	—	—	—	23	323	-35.2	25	30	325	-34.5	29	30	315	-39.6	48	29	326	-32.7	42	28	323	-35.8	—
10,000	31	272	-47.1	—	—	—	—	—	23	280	-42.7	—	30	282	-42.7	—	30	272	-46.6	—	2							

TABLE 1.—Mean free-air barometric pressure ( $P.$ ) in millibars, temperature ( $T.$ ) in degrees Centigrade, and relative humidities ( $R. H.$ ) in percent, obtained by airplanes and radiosondes during May 1940—Continued

Altitude (meters) M. S. L.	Stations and elevations in meters above sea level																												
	S. S. Marie, Mich. (221 m.)				Seattle, Wash. <sup>1</sup> (27 m.)				Shreveport, La. (Barksdale Field) (51 m.)				Spokane, Wash. (598 m.)				Washington, D. C. <sup>1</sup> (7 m.)				Atlantic Station <sup>2</sup> No. 1 (6 m.)				Atlantic Station <sup>4</sup> No. 2 (6 m.)				
	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	Number of obser-vations	P.	T.	R. H.	
Surface	31	986	6.7	85	27	1,014	13.6	73	31	945	13.0	64	31	1,012	13.7	79	29	1,020	17.9	81	27	1,020	15.3	79	27	961	11.6	86	
500	31	953	7.6	79	27	958	12.8	57	31	901	14.8	51	31	900	11.8	65	29	906	10.8	84	27	906	8.8	85	27	849	9.0	76	
1,000	31	898	6.1	76	27	903	10.9	51	31	849	11.6	49	31	847	9.3	65	29	854	4.4	71	27	852	7.1	74	27	792	1.0	60	
1,500	31	843	3.4	76	27	850	7.5	55	31	799	7.7	51	31	797	6.5	64	29	803	7.0	72	27	802	5.5	63	27	751	1.3	59	
2,000	31	792	1.0	76	27	800	4.3	60	30	752	3.4	55	31	749	3.9	61	28	756	4.4	71	27	754	3.7	59	27	706	-1.3	53	
2,500	31	744	-1.6	77	27	751	-1.3	53	30	706	-3	56	31	704	-0.9	56	28	710	1.7	71	27	709	1.3	53	27	622	-6.4	53	
3,000	31	699	-4.0	75	27	706	-1.3	53	29	623	-6.4	53	31	621	-4.8	47	28	627	-7	64	27	625	-4.6	49	27	540	-15.6	62	
4,000	29	615	-9.5	69	27	622	-7.2	49	29	547	-13.0	51	31	546	-10.9	42	28	552	-6.4	57	27	550	-10.1	45	27	472	-22.4	58	
5,000	28	472	-22.4	58	27	478	-20.2	57	29	479	-20.0	50	31	478	-17.3	37	27	484	-12.7	54	27	482	-16.3	44	27	410	-30.2	58	
6,000	27	410	-30.2	58	27	417	-27.4	63	29	418	-27.5	50	29	418	-24.6	34	27	423	-19.3	53	27	422	-23.4	46	27	360	-37.8	58	
8,000	25	360	-37.8	58	25	362	-34.9	71	29	363	-35.0	50	23	363	-32.4	34	26	369	-27.0	53	26	367	-31.0	44	25	311	-44.8	58	
9,000	25	268	-51.2	52	22	270	-49.2	2	28	270	-49.4	19	27	271	-47.8	22	27	277	-41.7	26	27	274	-45.8	26	25	230	-55.3	52	
10,000	25	230	-55.3	52	18	232	-54.8	2	28	232	-55.4	16	22	232	-53.8	22	22	238	-49.7	26	235	53.0	26	25	197	-56.1	52		
11,000	25	189	-55.3	52	15	198	-58.8	2	28	198	-58.6	13	21	199	-57.7	21	203	56.1	25	192	-59.5	25	25	145	-54.3	52			
12,000	25	145	-54.3	52	13	169	-59.4	2	28	169	-58.9	13	170	59.8	19	173	-60.6	25	162	-63.0	25	24	124	-57.7	52				
13,000	25	107	-55.0	52	6	106	-58.1	2	27	144	-57.3	12	145	-60.4	17	147	-60.3	24	129	-62.4	24	20	91	-55.3	52				
14,000	13	91	-55.1	52	6	90	-56.7	2	26	123	-66.3	10	124	-60.0	17	125	-68.5	23	107	-60.8	23	17	77	-55.1	52				
17,000	9	79	-54.8	52	5	76	-54.0	2	20	105	-55.9	6	106	-58.5	15	106	-58.5	23	89	-59.7	23	8	65	-54.9	52				
18,000	5	67	-54.1	52	—	—	—	—	17	77	-55.1	—	—	—	7	78	-55.9	17	60	-57.9	17	5	66	-55.3	52				
19,000	—	—	—	—	—	—	—	—	8	65	-54.9	—	—	—	5	66	-55.3	11	48	-56.3	11	7	38	-55.4	52				
20,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE.—All observations taken at 1 a. m., 75th meridian time, except those at Washington, D. C., Lakehurst, N. J., Norfolk, Va., and Pensacola, Fla., where they are taken before 5 a. m., 75th meridian time. At Pearl Harbor, T. H., observations are taken after sunrise.

None of the means included in this table are based on less than 15 surface or 5 standard level observations.

Number of observations refers to pressure only as temperature and humidity data are missing for some observations at certain levels; also, the humidity data are not used in daily observations when the temperature is below -40.0° C.

<sup>1</sup> U. S. Navy.

<sup>2</sup> Airplane observations.

<sup>3</sup> Lat. 35°00' N. to 40°00' N. Long. 55°00' W. to 60°00' W.

<sup>4</sup> Lat. 40°00' N. to 45°00' N. Long. 40°00' W. to 45°00' W.

TABLE 2.—Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during May 1940

[Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second]

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)		Albuquerque, N. Mex. (1,630 m.)		Atlanta, Ga. (299 m.)		Billings, Mont. (1,095 m.)		Bismarck, N. Dak. (612 m.)		Boise, Idaho (870 m.)		Brownsville, Tex. (7 m.)		Buffalo, N. Y. (220 m.)		Burlington, Vt. (132 m.)		Charleston, S. C. (18 m.)		Chicago, Ill. (192 m.)		Cincinnati, Ohio (157 m.)		Denver, Colo. (1,627 m.)								
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity						
Surface	31	138	2.0	31	233	1.2	31	287	3.2	31	360	1.9	31	355	2.7	31	306	3.9	30	129	5.4	29	144	0.5	31	189	3.6	28	322	2.9	30	50	1.4
500	31	158	2.9	29	279	6.0	29	312	2.5	31	305	3.8	26	143	4.0	29	243	3.4	29	190	1.3	31	214	4.2	28	323	1.5	29	257	4.2	—	—	
1,000	31	189	2.4	28	276	6.3	31	339	1.5	26	306	3.0	31	312	2.7	21	171	2.5	22	239	4.4	27	223	4.9	30	260	5.5	24	273	3.4	25	257	
1,500	31	189	2.4	28	276	6.3	31	339	1.5	26	306	3.0	31	312	2.7	21	171	2.5	22	239	4.4	27	223	4.9	30	260	5.5	24	273	3.4	25	257	
2,000	29	224	2.3	31	235	2.3	27	286	7.0	31	292	1.9	25	299	4.9	31	310	1.3	16	221	1.1	18	269	5.7	20	238	5.9	24	273	4.9	28	312	
2,500	28	253	3.6	31	239	2.1	28	287	7.4	31	287	3.1	24	302	7.6	31	244	1.1	16	259	1.4	16	280	6.9	17	274	5.7	23	274	6.3	21	261	
3,000	28	284	5.0	29	257	2.7	25	287	8.0	30	284	5.0	14	314	9.6	31	251	2.4	16	287	3.2	—	—	11	299	7.4	22	269	7.2	—	—		
4,000	25	289	7.8	29	279	4.3	21	289	7.5	27	274	8.5	—	—	26	234	4.5	15	294	7.0	—	—	—	—	—	20	278	8.1	—	—	14	278	
5,000	22	295	9.1	26	287	6.3	17	302	10.0	22	276	11.0	—	—	20	244	4.6	13	299	10.2	—	—	—	—	—	14	286	6.9	—	—	24	287	
6,000	17	302	10.4	23	291	4.6	15	299	10.8	17	273	12.5	—	—	17	268	7.8	—	—	—	—	—	—	—	—	—	—	—	—	22	288		
8,000	15	297	10.6	21	273	8.9	13	287	9.9	13	274	14.9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16	310			
10,000	—	—	—	16	285	9.7	11	279	12.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	300		
12,000	—	—	—	15	279	13.0	—	—	—	—																							

TABLE 2.—Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during May 1940—Continued

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.)		Ely, Nev. (1,910 m.)		Grand Junction, Colo. (1,413 m.)		Greensboro, N. C. (271 m.)		Havre, Mont. (766 m.)		Jacksonville, Fla. (14 m.)		Las Vegas, Nev. (570 m.)		Little Rock, Ark. (79 m.)		Medford, Oreg. (410 m.)		Miami, (10 m.)		Minneapolis, Minn. (261 m.)		Mobile, Ala. (10 m.)		Nashville, Tenn. (194 m.)														
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity												
Surface	31	246	2.4	31	214	2.0	31	307	2.4	27	226	2.5	31	254	1.0	30	135	2.4	31	189	3.3	30	239	1.2	31	315	1.6	30	108	2.6	30	344	2.1	31	166	2.0	30	285	2.3
500	—	—	—	—	—	—	—	—	—	27	225	3.5	—	—	—	30	190	2.1	31	308	1.8	30	235	1.7	31	304	0.5	30	340	2.1	31	245	2.5	30	287	3.3			
1,000	—	—	—	—	—	—	—	—	—	27	236	4.9	31	267	1.6	29	243	3.4	31	199	3.7	—	—	—	29	250	3.3	31	278	2.3	30	275	3.7						
1,500	31	249	3.2	—	—	—	31	303	2.5	27	248	5.1	31	258	2.9	28	204	4.7	31	188	3.1	29	265	4.8	31	261	0.9	28	296	2.8	31	299	2.9	29	276	5.2			
2,000	31	255	2.8	31	211	3.5	31	286	3.0	24	263	5.1	31	254	2.7	26	278	6.4	31	197	3.1	26	281	7.4	31	190	2.0	26	278	3.2	30	311	3.7	26	276	6.5			
2,500	30	247	3.3	31	209	3.1	31	282	2.9	18	280	7.3	29	255	3.6	23	278	6.4	31	210	3.0	25	283	7.8	31	187	3.9	26	277	4.2	30	304	6.3	27	310	4.7	24	285	7.0
3,000	28	261	3.9	31	205	3.2	31	282	3.0	16	279	8.0	26	265	5.1	26	282	6.9	30	215	4.9	25	291	4.6	29	190	4.7	24	281	5.2	18	314	9.6	26	308	6.1	20	285	8.4
4,000	25	254	5.2	31	227	4.2	31	260	4.9	12	296	9.9	16	270	5.7	26	275	7.1	29	224	5.2	22	299	10.1	28	214	0.1	23	279	6.3	—	20	285	4.9	17	284	9.3		
5,000	18	263	6.7	26	244	6.3	25	272	5.5	—	—	—	14	282	7.1	22	286	7.9	29	240	6.1	15	299	11.7	25	233	5.9	21	282	7.1	—	18	288	5.9	13	282	9.5		
6,000	13	271	7.8	20	245	9.2	21	283	6.4	—	—	—	10	300	6.7	22	282	11.1	28	246	6.2	11	298	12.0	22	241	8.6	20	276	9.4	—	18	287	8.4	—	—	—		
8,000	—	—	—	16	248	10.6	—	—	—	—	—	—	—	—	—	20	284	11.3	24	259	6.3	—	—	17	248	13.5	16	285	11.9	—	—	—	—	—	—				
10,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	282	14.7	18	294	5.4	—	—	11	273	15.0	11	284	19.5	—	—	—	—	—	—				
12,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16	277	15.5	15	264	10.6	—	—	10	278	18.5	—	—	—	—	—	—	—	—	—				
14,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14	273	20.8	12	263	11.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—				

TABLE 3.—Maximum free-air wind velocities (m. p. s.), for different sections of the United States

(Based on pilot balloon observations during May 1940)

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast <sup>1</sup>	41.0	WNW	2,440	7	New York	42.7	SW	2,870	19	Columbus	44.0	W	6,760	9	Boston
East-Central <sup>2</sup>	32.0	SW	1,290	15	Knoxville	34.2	SW	3,200	2	Richmond	35.0	NNW	7,160	5	Greensboro
Southeast <sup>3</sup>	31.0	NW	1,890	4	Tampa	38.8	NNW	2,980	3	Mobile	50.4	NW	12,500	21	Miami
North-Central <sup>4</sup>	40.4	WNW	2,120	6	Sault Ste. Marie	40.8	NNW	3,240	2	Minneapolis	59.6	NNW	7,300	1	Huron
Central <sup>5</sup>	35.8	SW	1,100	13	Des Moines	41.0	WSW	4,000	7	Omaha	57.5	NNW	8,040	2	Omaha
South-Central <sup>6</sup>	41.2	NNW	2,470	1	Oklahoma City	36.8	NW	4,020	1	Dallas	47.8	WNW	7,290	11	Brownsville
Northwest <sup>7</sup>	41.3	W	1,972	6	Pocatello	46.6	W	2,890	4	Pocatello	55.0	WNW	10,940	12	Medford
West-Central <sup>8</sup>	26.2	S	1,710	4	Salt Lake City	54.4	SW	4,120	2	Winnemucca	62.0	WSW	8,620	3	Winnemucca
Southwest <sup>1</sup>	30.9	WNW	2,280	17	Roswell	27.3	W	2,730	13	El Paso	48.0	WSW	16,915	28	Albuquerque

<sup>1</sup> Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.<sup>2</sup> Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.<sup>3</sup> South Carolina, Georgia, Florida, and Alabama.<sup>4</sup> Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.<sup>5</sup> Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.<sup>6</sup> Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.<sup>7</sup> Montana, Idaho, Washington, and Oregon.<sup>8</sup> Wyoming, Colorado, Utah, northern Nevada, and northern California.<sup>9</sup> Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

\* Data for Buffalo, Elmira, and Atlanta not included in this table.

TABLE 4.—*Tropopause summary, May 1940—Continued*

Stations.....	Albuquerque, N. Mex.			Atlanta, Ga.			Billings, Mont.			Bismarck, N. Dak.			Boise, Idaho			Buffalo, N. Y.			Charleston, S. C.							
	Potential tempera-tures °A.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.				
290-299																										
300-309																										
310-319																										
320-329	5	10.1	48.4	8	10.2	50.1	15	10.6	55.1	20	10.5	55.0	24	9.9	49.6	23	10.0	51.1	11	9.8	46.5					
330-339	26	11.4	55.5	12	11.3	55.6	21	11.6	60.1	22	11.6	60.0	29	11.8	60.2	29	11.6	59.8	17	11.4	55.0					
340-349	20	12.8	63.2	20	12.7	61.8	15	12.7	63.4	5	12.1	59.4	16	12.7	63.8	11	12.4	61.2	21	12.7	62.0					
350-359	8	13.6	64.9	13	13.4	63.4	3	13.4	65.3	1	13.5	66.0	6	13.6	64.8	3	13.0	60.7	10	13.5	64.4					
360-369	1	14.4	65.0	1	13.4	50.0				1	13.7	60.0	1	14.1	65.0				2	14.2	64.0					
370-379	1	15.8	69.0							1	13.7	55.0	1	14.3	60.0				2	14.6	63.0					
380-389	2	15.2	63.0	2	15.6	67.0				2	14.0	55.0				2	14.0	57.5	2	15.3	65.5					
390-399	4	16.0	64.2	4	15.5	61.0	2	15.1	58.5				1	15.3	61.0	2	15.2	59.5	4	15.6	61.5					
400-409	5	16.4	64.0	6	16.3	65.2	2	15.8	59.0	2	15.6	56.5	4	16.8	58.8	2	15.6	60.0	3	16.5	63.7					
Weighted means.....		12.8	59.8		12.6	59.0			11.8	58.9			11.2	56.0				11.8	57.7			11.3	56.1		12.5	58.4
Mean potential temperature °A (weighted).....		349.5			349.4				337.5				333.9					340.2			336.7			347.9		
Number days with observations.....		28			28				27				25					30			29			28		
Stations.....	Denver, Colo.			El Paso, Tex.			Ely, Nev.			Fairbanks, Alaska			Joliet, Ill.			Juneau, Alaska			Lakehurst, N. J.							
	Potential tempera-tures °A.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.				
290-299																										
300-309																										
310-319	1	7.8	33.0																							
320-329	8	10.6	52.8	3	9.7	43.0																				
330-339	16	11.8	58.9	16	11.6	55.9	24	11.8	59.6																	
340-349	22	12.8	64.0	25	12.8	61.8	15	13.1	65.3																	
350-359	2	13.6	66.5	15	13.6	63.5	3	13.8	66.3																	
360-369	3	14.5	66.7	2	14.6	65.5																				
370-379																										
380-389																										
390-399	2	15.4	59.0	4	15.9	66.2	1	15.2	59.0	1	13.8	47.0	1	15.0	56.0	1	14.4	52.0	1	14.4	55.0					
400-409	4	16.0	60.8	4	16.5	66.0	1	16.5	67.0	1	14.3	46.0	1	15.7	60.0	1	14.4	52.0	1	15.1	56.0					
Weighted means.....		12.6	60.4		13.1	60.7			12.2	59.9			9.1	51.2				11.1	54.5			9.4	53.0		11.1	54.8
Mean potential tem-perature °A. (weighted).....		345.8			351.6				341.3				315.7					336.6			317.0			335.3		
Number of days with observations.....		25			28				24				27					25			22			27		
Stations.....	Medford, Oreg.			Miami, Fla.			Minneapolis, Minn.			Nashville, Tenn.			Oakland, Calif.			Oklahoma City, Okla.			Omaha, Nebr.							
	Potential tempera-tures °A.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.	Num-ber of cases	Mean altitude (km.) m. s. l.	Mean tem-pera-ture °C.				
290-299																										
300-309	1	8.5	51.1																							
310-319	2	9.3	51.0																							
320-329	13	10.1	51.1																							
330-339	27	11.7	59.8	13	10.5	45.1	16	11.3	62.0	18	11.4	56.8	27	11.9	56.6	24	11.9	58.7	26	11.7	59.0					
340-349	14	12.8	64.9	26	12.4	57.5	3	12.3	61.0	19	12.6	61.2	23	12.9	65.7	25	13.0	65.5	15	12.4	61.5					
350-359	7	13.5	66.0	20	13.4	62.1				8	13.4	63.0	2	13.1	60.5	6	13.7	66.3	2	13.7	66.5					
360-369				3	14.7	68.0							3	13.3	59.3				2	13.0	54.5					
370-379	1	14.3	62.0	9	15.1	67.1				2	14.0	58.0														
380-389	1	14.3	59.0	8	15.9	67.9	2	14.2	55.0	1	14.3	56.0	1	14.7	62.0	3	15.3	63.7	1	15.1	62.0					
390-399	1	14.5	56.0	1	16.3	67.0	1	14.6	56.0	1	15.9	65.0	6	15.7	62.8	6	15.8	65.0	3	15.1	63.3					
400-409	1	15.2	56.0	8	17.1	69.2	2	15.4	56.0	1	15.7	60.0	3	16.1	61.3	1	15.8	63.0	2	15.6	58.0					
Weighted means.....		11.9	59.3		13.5	60.2			11.1	56.0			11.9	57.0				12.5	60.7			12.7	61.6		11.8	57.1
Mean potential tem-perature °A. (weighted).....		338.5			358.6				336.8				342.4					345.8			346.3			340.1		
Number days with observations.....		30			29				20				30					31			27			30		

TABLE 4.—*Tropopause summary, May 1940—Continued*

Stations	Phoenix, Ariz.			St. Louis, Mo.			San Antonio, Tex.			San Diego, Calif.			Sault Ste. Marie, Mich.			Seattle, Wash.			Spokane, Wash.					
	Potential temperatures °A.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.		
290-299														1	6.7	43.0								
300-309														5	7.9	49.4						4	7.9	45.5
310-319					11	8.1	38.1	1	9.8	42.0				6	8.8	46.3	5	9.2	53.0		6	9.2	53.2	
320-329	6	9.9	45.7	19	9.7	47.7	4	11.0	53.0	3	11.2	56.3	22	10.1	52.9	8	10.7	56.2	22	10.3	51.6			
330-339	20	11.3	53.0	23	11.4	56.9	11	10.9	49.0	16	11.5	56.4	17	11.5	59.7	3	11.3	55.3	20	11.6	59.2			
340-349	25	12.8	62.3	16	12.7	62.8	26	12.4	58.0	13	12.8	62.9	4	11.8	57.0	5	12.8	63.8	12	12.6	62.4			
350-359	9	13.7	63.8	1	13.1	61.0	19	13.7	64.1	5	13.8	65.6												
360-369	1	14.7	68.0	1	13.3	56.0	4	14.2	65.2	1	14.4	67.0	1	12.8	54.0					1	14.1	66.0		
370-379	3	14.5	62.3	2	13.9	55.5	1	14.8	67.0															
380-389	1	15.9	70.0	1	14.6	60.0	2	15.8	64.5				1	14.4	57.0					1	14.2	54.0		
390-399	3	16.3	67.0	4	15.0	56.2	7	16.3	66.9	1	15.3	60.0							2	14.9	55.5			
400-409	1	16.6	63.0	4	15.9	60.0	5	16.8	68.6	3	16.6	66.7	1	15.6	58.0				2	15.8	57.5			
Weighted means		12.6	58.8		11.4	53.5		13.2	59.8		12.7	60.6		10.5	54.2		10.9	57.1		11.2	56.0			
Mean potential temperature °A (weighted)		346.5			340.3			354.4			343.4			328.4			328.4			334.8				
Number days with observation		29			29			28			24			25			16			28				

Stations	Atlantic Sta. 1 (lat. 36, long. 53)			Atlantic Sta. 2 (lat. 42, long. 38)			
	Potential temperatures, °A.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290-299							
300-309					1	8.1	48.0
310-319					3	8.6	44.7
320-329	10	10.7	54.0	12	10.2	51.2	
330-339	11	11.9	61.6	23	11.7	58.7	
340-349	18	12.9	65.1	19	12.9	63.4	
350-359	8	13.6	66.1	4	13.9	67.0	
360-369	1	14.7	71.0	4	14.3	67.0	
370-379							
380-389				2	14.9	60.5	
390-399	1	15.8	65.0	2	15.7	62.5	
400-409	2	16.0	63.0				
Weighted means		12.6	62.4		12.0	59.0	
Mean potential temperature °A (weighted)		343.5			340.9		
Number days with observations		20			27		

## RIVERS AND FLOODS

[River and Flood Division, MERRILL BERNARD in Charge]

By BENNETT SWENSON

Except for floods in the Ohio Valley that continued from April, only a few minor to moderate floods occurred during May 1940. The month was generally deficient in precipitation, except in the northeast, the Great Lakes region, Kansas, and New Mexico.

*Atlantic Slope Drainage.*—The following report on a flood in the Merrimack River Basin is submitted by the Concord, N. H., office:

A moderate rise in stages on the Pemigewasset and Merrimack Rivers occurred on May 3 to 6. Flood stages were reached in the headwater reach of the Pemigewasset near Lincoln, and thence down-stream to Manchester.

The Pemigewasset was the only tributary which contributed to the high flow. The Contoocook rose less than one foot. Crest stages at Plymouth, Franklin, Concord, and Manchester were the highest reached since the September 1938 flood.

Stages had been moderately high since the rise in mid-April. Snow in the Pemigewasset valley began to melt rapidly on April 29, due to unseasonably high temperatures. The resulting run-off gradually filled the channels to within a few feet of flood stage. Rain, attended by high temperatures began on the early morning of May 2, and continued intermittently until the early morning of May 5. The accelerated rate of snow melt, combined with the rainfall of this period resulted in a minor flood.

Moderate flooding occurred in the Connecticut River from May 2 to 10 as the result of the following conditions:

Several days of temperatures in the seventies during the last week of April caused a rapid melting of the snow which remained in the upper reaches of the basin. The resulting run-off increased the flow at South Newbury, Vt., from approximately 10,000 cubic feet per second on April 25 to 46,000 on May 5. To this run-off was added that from rains during the period May 2-5, the combined flow producing stages above the flood level quite generally.

*East Gulf of Mexico Drainage.*—Moderate to heavy rainfall over Mississippi and Alabama between April 29 and May 1, produced moderate flooding in the Tombigbee, Pearl, and Pascagoula Basins during the first part of May. In the Tombigbee River the flooding was confined mainly to the lower portion; no damage of consequence was reported.

An interesting feature of the flood in the Pascagoula River was the distribution of rainfall on April 30 and the resulting rapid rises in the Chickasawhay River by May 1. The 7-inch rainfall area seems to have covered narrow por-